Utah Rock Art Research Association
P.O. Box 511324 Salt Lake City, UT 84151-1324 www.utahrockart.org

May 3, 2016

BLM Richfield Field Office
Attention: Lauren Kingston
150 East 900 North
Richfield, UT 84701

Dear Lauren:

Thank you for the opportunity to review and comment on Chapter 7 of the Class I Cultural Resource Inventory in development for the Richfield Field Office (RFO).

The Utah Rock Art Research Association (URARA) is the largest organization dedicated to Utah rock art. Our mission is:

- To lead in the preservation and understanding of the value of rock art.
- To encourage the appreciation and enjoyment of rock art sites.
- To assist in the study, presentation, and publication of rock art research.

Our 300 members have professional, academic, and avocational interest in Utah rock art. Combined, our membership represents the largest body of knowledge regarding Utah rock art. We have worked with the Richfield Field Office (RFO) as a consulting party and have an extensive history of collaborating with the BLM throughout Utah.

We appreciate the level of effort and attention to detail that has gone into the development of the predictive model for the RFO. However, we have concerns about the quality of the data used in the model, its planned use, and the involvement of consulting parties.

Data Quality

Small Site Sample Size

The initial data set comes from site locations found in a small subset of the RFO. As noted in the Resource Management Plan developed for the RFO:

> Cultural resource inventories have been conducted in the lands managed by the RFO for more than 30 years at varying levels using a variety of methods. Most of the inventories were conducted in accordance with Section 106 of the National Historic Preservation Act (NHPA) as part of impact mitigation from surface disturbing activities, although academic institutions have performed some research excavations. Inventories have identified several thousand cultural properties throughout the RFO, representing a wide variety of site types and chronological periods. Overall, less than 5% of the RFO has been inventoried.[1]

[1] Richfield Field Office Draft Resource Management Plan and Environmental Impact Statement, October 2007, Pages 3-18/19

There are two concerns of note in the preceding quote. First, the data set is small. While we expect that the amount of inventory has grown since the data in the 2007 RMP we doubt that it is significantly larger than the 5% noted almost a decade ago. Secondly, the bulk of the data is derived from surveys associated with Section 106 of the National Historic Preservation Act due to "surface disturbing activities." These activities tend to revolve around roads, pipelines, electrical and other transmission lines, mineral leasing, and construction. These activities generally occur in similar types of locations. Thus the data set is both small, and non-representative of the RFO resources.

We believe that statistical cultural site prediction requires a solid data set that this model lacks The model results demonstrate our concern. Tables 7-15 and 7-16 provide, what appears to be, compelling data for rock art site prediction. But this is because the Total % Correct data is highly skewed by the % Correct Non-site data. The model only accurately predicts the location of sites roughly 23% of the time.[2] Given our concerns about the small site sample size these values may be overstated for the RFO as a whole.

Use of Available Site Data

The chapter notes the sensitivity of the model to the data input and suggests "models be continually refined…as new data becomes available."[3] For this reason, we do not understand why only 20% of non-BLM data for land within the broader RFO boundaries was incorporated into the data set. Regardless of whether the data comes from National Parks, Forest Service, or SITLA properties it is likely that the inclusion of additional, representative, data would improve the value of the predictive model for resource determination within the BLM lands.

Additionally, it is unclear to us why the data set does not incorporate data from other field offices with similar cultural and geographical values. Ancient peoples did not recognize the boundaries between the Price or Fillmore field offices and the RFO. Since SWCA is working on predictive models for both of these areas it would make sense to broaden the data set to include information that was culturally and geographically consistent with the RFO.

We understand that the RFO has recently surveyed road areas in the Henry Mountains. We believe that any new data from these surveys would make a valuable contribution to the predictive model.

Non-Representative Site Data

While data quality would appear to be high from the prediction and gain charts (tables 7-15 through 7-20) the process of setting aside 50% of the sites and then determining whether they can be accurately predicted is less useful because of the small data set (129 overall rock art sites, so 65 in the model) and consistent, but non-representative, sampling of the cultural resources of the RFO (other section 106 sites).

[2] See Appendix 1 for tables 7-15 and 7-16 with overall data.
[3] P. 7-58

A metaphor might be if someone was developing a predictive model for your house and had done almost all the surveys in the kitchen. Having set aside 50% of the sites in the kitchen data testing would accurately predict that kitchen type sites were, in fact, in the kitchen. But that data would be less likely to identify the nature of the bedroom, bathroom, or garage.

Model Variables – All Cultural Sites

The model is based on the world today using variables that are derived from current geographic information systems (GIS) data points. Prehistoric people did not live in today's world and were not concerned about modern GIS data layers. We are concerned that the model does not consider temporal, climatic, geographical, and cultural variation. Climate varies over time, so proximity to water was not the same 1000 years ago as it is today as springs and lakes develop or dry up and rivers meander and change course. Prehistoric people used different transportation routes than modern roads. Metrics of site distance to current resources may not have been valid for people living long ago.

Assigning consistently weighted environmental variables to different cultural groups using the land at different times is not valid. Hunter gatherers moved through the RFO differently than the more sedentary Fremont. While we appreciate the predictive model's split between high elevation and low elevation zones we believe that this could be taken to a much broader level. There are many types of "splits" that could have been done to make the model more accurate.

Just as proximity to water is important so is proximity to food sources, building materials, wood for heating and cooking. Many academic articles discuss an "economic" model for food procurement. Essentially, an economic model examines whether it costs more calories to produce the food than is gained from the consumption of the food. These models evaluate a broad set of flora, fauna, and environmental variables compared to travel and procurement costs. Likewise, at a URARA symposium Jerry Spangler discussed his findings at Nine Mile Canyon that winter habitation sites were found closer to firewood. If the BLM wants to build a strong predictive model the variables must consider the flora, fauna, and environment that are necessary for daily survival.

This predictive model uses broad simplification of temporal, climatic, geographical, and cultural variation in order to reduce complexity in computer processing. But reality *is* complex and requires high data levels to accurately model. This requires data, time, and resources which were not used in the creation of the model. In our opinion, the model design is insufficient to identify cultural site locations.

Model Variables – Rock Art

There is data relevant to rock art which is not part of the variables used in the model. For example:

- We know that rock art sites are much more common at canyon and drainage confluences.

- URARA members have noted that rock art is more prevalent on certain rock strata surfaces.[4]
- Protected rock surfaces (overhangs, alcoves, small caves) are important for rock art either because they have protected the rock art or were deliberately chosen as site locations.
- Isolated boulders independent of slope (may be found on talus slopes or flat terrain)
- URARA members have also commented on aesthetics, acoustics, archeoastronomy, viewshed, prehistoric roads, horizontal rock surfaces, and a variety of other possible data points not included in the model for the location of rock art sites.
- Ethnographic research from modern Native American tribes indicates that the "mythological landscape" was important in terms of where sites were located. These landscapes are places where one or more cultures imbue the land with meaning. This meaning influences how a culture uses the land. Elements of the land, such as springs, mountain peaks, certain boulders and caves may be seen as sacred or inhabited by spirits. As such, they may be avoided, sites of prayers or be ceremonial sites. Some archeologists believe many rock art panels are associated with what we call "symbolic" or "mythical" landscapes. The rock art site participates in a cultural narrative rather being a located for geographic reasons such as distance to water, slope, elevation, etc. For example, certain Dinwoody petroglyphs in Wyoming are carved on a rock surface with special attention given to the way light and shadows cross the surface creating the impression of movement in the carving. Petroglyph owls seem to open and close their eyes as the shadows shift. Human figures appear to weep, light creates an impression of tears rolling down rock faces. Carved suns seem to radiate light. This is one of the many reasons why a statistical model designed to find repeating site locations based on topographic variables will not be successful predicting rock art sites which reflect or participate and a landscape shaped by an ancient cultural narrative.

Data Quality Conclusions

Due to these concerns about the data quality of the model we believe it is imperative to:

- Incorporate as many data sources as possible.
- Test the model against real world data through extensive class II random sampling throughout the RFO to determine if there is a data bias based on Section 106 sources.
- Provide consulting parties the class II random sampling results for analysis and approval prior to use of the model for planning decisions.

Use of the Predictive Model

We are concerned about how the BLM will use this predictive model for planning decisions within the RFO. The current predictive model is based on poor data and is simply a guess at the locations of cultural resources.

[4] Jenkinson, Richard; Rock Art on an Ancient Migratory Route; Utah Rock Art Volume 30, 2010.

We support the use of a predictive model which consulting parties concur has high predictive value for cultural resources. Such a model could be used in "macro level" planning decisions. For example, if there are two routes to a destination one going through a low cultural resource sensitivity area and one going through a high cultural resource sensitivity area it makes sense to start Section 106 work in the low sensitivity area. However, the predictive model cannot supplant actual on-the-ground data collection as required by Section 106 of the National Historic Preservation Act before that road is actually developed. Likewise the predictive model might provide guidance for leasing decisions but it shouldn't take the place of a more thorough Master Leasing Plan and thoughtful leasing decisions based on real data.

Sensitivity

We are very concerned about how sensitivity was defined in the model. Because sensitivity was defined by considering only the eligible and not eligible sites it excludes 23%[5] of the sites in the data set simply because they were undetermined or unknown. We are also concerned that some of the not eligible determinations may be based on antiquated views of archeology. For example, 10 of the 129 rock art sites are deemed not eligible[6] which would be an unusually high number under current standards. Sensitivity values are an important consideration since the inclusion of lands with sensitivity levels of 31-40 would almost triple the amount of high density acres. To accurately predict sensitivity it is necessary to make a national register eligibility determination for the undetermined and unknown sites and test the determination of not eligible sites focusing on sites with older documentation.

URARA and other groups with site information may provide the BLM with additional site data currently not in the BLM records. This site data may not meet SHPO standards for IMACS level documentation and are unlikely to have a national register eligibility determination. We recommend each of these sites be considered eligible when used in the predictive model until a qualified archeologist can make a determination.

Predictive Model Updates

Chapter 7 recommends that the predictive model be updated on an annual basis for the addition of new data.[7] It is unclear to us how this will be done. In our discussions with BLM archeologists they have indicated they don't have the skill set to update the predictive model. Will the BLM maintain a contract with a consulting agency to improve the model over time? If the model is to be used to make planning decisions into the future we believe the model must be updated and tested on an annual basis to be as useful as possible.

Involvement of Consulting Parties

It is our understanding that the development of the information derived from the predictive model will serve as the basis for planning in the RFO for at least the next decade. Given the importance of this model it is disturbing that consulting parties were involved at the last

[5] Table 7-21 (752/3228=23%)
[6] Table 7-21
[7] P. 7-58

moment and given insufficient time to analyze the complex materials furnished. While we were invited to consult on this project, the reality is the timeframe has not allowed us to do anything but comment on a pre-determined solution. The following is the history of our involvement in this project to the best of our recollection.

- Feb. 19 Richfield field office contacts URARA to be a consulting party for the Class I cultural Resource Inventory. We request consulting party status.
- March 31 Richfield and Fillmore Meeting. URARA in attendance.
- April 6 Fillmore office circulates MOU for Class I
- April 7 URARA responds with concerns
- April 13 Agree to final MOU with Nathan Thomas for statewide use for URARA
- April 19 URARA notifies field office archeologists of the availability of the URARA publication archive for use in the literature reviews. URARA receives a copy of the Richfield predictive model for the class I inventory and signs the Richfield MOU.
- April 22 URARA requests an extension of the Richfield comment period
- April 25 URARA meets with Richfield and Fillmore archeologists and provides them our site location data.
- April 26 Southern Utah Wilderness Association response period extended to May 6. URARA was never notified of a similar extension by the BLM.
- April 27 URARA receives notification that the Richfield and Fillmore archeologists have been able to add our site data to their GIS system.
- April 28 RFO extends predictive model response date for URARA to May 3. URARA receives notification that the site location data has been uploaded into the BLM GIS system and available on the BLM servers for other field offices.

This bulleted list shows that the timeframe for URARA's participation was so short as to be ludicrous. The timeline effectively makes consulting parties commenters and not participants in the process. For example, URARA has a site database with roughly 4000 records mostly for rock art sites. Our data would have been useful in the preparation of the predictive model. But the model was finished before we were even brought into the process. In addition, if URARA had known about the project in advance we could have canvassed our members for additional site data. But that takes months of participation, not weeks. We believe the Class I material will suffer from inadequate opportunities for all consulting parties to effectively participate. We are not satisfied with this process and feel it is not adequate for consultation.

Picky comments

- It is easy to create PDF documents that have text recognition which allows for search and copy and paste features. It simplifies the task of the consulting parties if this step is taken. At 73 pages of dense material this chapter is daunting to move through without such aids.
- We had trouble following the data in the various tables in chapter 7. Prehistoric rock art sites are numbered as: 57 in table 7-5; 4 in table 7-7; 57 in 7-9; 129 in table 7-12;

121 in table 7-17 with another possible 13 in 7-18; 129 in 7-20; 129 in 7-21. We hope there is greater consistency within the model itself.

- It is difficult to follow the math in several of the tables. We encourage you to provide some aids as to how calculations are being performed.

Thank you for your consideration of these comments.

Troy Scotter
Conservation & Preservation Committee

Appendix 1: Tables 7-15 and Tables 7-16 In An Understandable Format And Aggregate Data

Table 7-15 (Lowlands)

Site Type	Sample	True Positive	False Positive	True Negative	False Negative	% Correct Site	% Correct Non-site	Total % Correct
		Site Detected "A"	Non Site Detected As Site "B"	Non Site Correctly Detected "C"	Site Detected as Non Site "D"	A/(A+D)	C/(C+B)	(A+C)/(A+B+C+D)
Historic Architectural -	1	218	569	3,165	1,649	11.7%	84.8%	60.4%
Residential/Farming/Ranching	2	381	476	2,578	1,146	25.0%	84.4%	64.6%
Historic Architectural - Other	1	211	323	1,841	871	19.5%	85.1%	63.2%
	2	26	98	860	453	5.4%	89.8%	61.7%
Historic Artifact Scatter	1	2,211	1,913	14,531	6,011	26.9%	88.4%	67.9%
	2	1,814	1,751	14,861	6,492	21.8%	89.5%	66.9%
Prehistoric Open Artifact Scatter	1	3,582	2,361	33,515	14,356	20.0%	93.4%	68.9%
	2	6,258	4,271	34,961	13,358	31.9%	89.1%	70.0%
Prehistoric Open Lithic Scatter	1	2,411	2,557	43,665	20,700	10.4%	94.5%	66.5%
	2	1,813	1,180	46,482	22,018	7.6%	97.5%	67.6%
Prehistoric Open with Features	1	493	566	15,820	7,700	6.0%	96.5%	66.4%
	2	1,026	1,639	16,795	8,191	11.1%	91.1%	64.4%
Prehistoric Rock Art	1	778	413	4,617	1,737	30.9%	91.8%	71.5%
	2	341	386	4,510	2,107	13.9%	92.1%	66.1%
Prehistoric Sheltered	1	225	267	1,941	879	20.4%	87.9%	65.4%
	2	481	525	3,241	1,402	25.5%	86.1%	65.9%
Total	1	10,129	8,969	119,095	53,903	15.8%	93.0%	67.3%
	2	12,140	10,326	124,288	55,167	18.0%	92.3%	67.6%

Table 7-16 (Uplands)

Site Type	Sample	True Positive	False Positive	True Negative	False Negative	% Correct Site	% Correct Non-site	Total % Correct
		Site Detected "A"	Non Site Detected As Site "B"	Non Site Correctly Detected "C"	Site Detected as Non Site "D"	A/(A+D)	C/(C+B)	(A+C)/(A+B+C+D)
Historic Architectural -	1	14	17	183	86	14.0%	91.5%	65.7%
Residential/Farming/Ranching	2	115	177	959	453	20.2%	84.4%	63.0%
Historic Architectural - Other	1	29	38	320	150	16.2%	89.4%	65.0%
	2	336	89	1,395	406	45.3%	94.0%	77.8%
Historic Artifact Scatter	1	148	212	1,032	474	23.8%	83.0%	63.2%
	2	141	231	1,369	653	17.8%	85.6%	63.1%
Prehistoric Open Artifact Scatter	1	3,046	1,232	7,536	1,338	69.5%	85.9%	80.5%
	2	2,556	1,168	7,220	1,638	60.9%	86.1%	77.7%
Prehistoric Open Lithic Scatter	1	4,264	2,173	13,973	3,809	52.8%	86.5%	75.3%
	2	2,586	1,699	12,825	4,676	35.6%	88.3%	70.7%
Prehistoric Open with Features	1	452	375	2,295	883	33.9%	86.0%	68.6%
	2	480	217	1,489	373	56.3%	87.3%	76.9%
Prehistoric Rock Art	1	156	66	472	113	58.0%	87.7%	77.8%
	2	106	94	978	430	19.8%	91.2%	67.4%
Prehistoric Sheltered	1	164	88	498	129	56.0%	85.0%	75.3%
	2	353	161	939	197	64.2%	85.4%	78.3%
Total	1	8,273	4,201	26,309	6,982	54.2%	86.2%	75.6%
	2	6,673	3,836	27,174	8,826	43.1%	87.6%	72.8%

Aggregate Values For Lowlands and Uplands

	Sample	True Positive	False Positive	True Negative	False Negative	% Correct Site	% Correct Non-site	Total % Correct
		Site Detected "A"	Non Site Detected As Site "B"	Non Site Correctly Detected "C"	Site Detected as Non Site "D"	A/(A+D)	C/(C+B)	(A+C)/(A+B+C+D)
Total Lowlands	1	10,129	8,969	119,095	53,903	15.8%	93.0%	67.3%
	2	12,140	10,326	124,288	55,167	18.0%	92.3%	67.6%
Total Uplands	1	8,273	4,201	26,309	6,982	54.2%	86.2%	75.6%
	2	6,673	3,836	27,174	8,826	43.1%	87.6%	72.8%
Combined Total	1	18,402	13,170	145,404	60,885	23.2%	91.7%	68.9%
	2	18,813	14,162	151,462	63,993	22.7%	91.4%	68.5%